amount of this is considerable, a brown extractive, sometimes in large quantity, the aqueous solution of which, by exposure to air, yields a further supply of coloured indigo, and which closely resembles hæmatin in its chemical manifestations and elementary composition. There is therefore great reason for believing that in the majority of the cases here recorded, the blue indigo was derived from altered hæmatin, although it is at the same time probable, that in some cases it is formed from modified urine pigment which is itself supposed to be a modification of hæmatin. Between the greater number of the animal colouring matters there is the closest relationship in chemical composition, so that the transformation of the one into the other would appear to be both easy and natural.

4thly. That the urines in which the coloured indigo occurs in the largest quantity, are usually of a pale straw colour, readily becoming turbid, alkaline, and of low specific gravity. Small quantities of indigo are however frequently found in urines possessing characters the very reverse, that is, in such as are high-coloured, acid, and of high specific gravity; but, as a rule, in these urines the blue pigment is usually absent.

5thly. That as coloured indigo does not occur in healthy urine, and since where the amount of this is at all considerable it is accompanied with strongly-marked symptoms of deranged health, the formation of blue indigo in urine must be regarded as a strictly pathological phenomenon, apparently associated rather with some general morbid condition, than essentially with disease of any one organ; although there is reason for believing that the blue deposit is met with very frequently in Bright's disease, and in affections of the organs of respiration, it should however be remarked that none of the worst cases of indigo in the urine which the author met with were cases of Bright's disease.

The paper is illustrated by drawings, and a specimen of the indigo, as deposited from urine, was exhibited.

5. "On the Thermal Effects of Elastic Fluids." By Professor William Thomson, F.R.S., and J. P. Joule, Esq., F.R.S. Received June 15, 1853.

The authors had already proved by experiments conducted on a small scale, that when dry atmospheric air, exposed to pressure, is made to percolate a plug of non-conducting porous material, a depression of temperature takes place increasing in some proportion with the pressure of the air in the receiver. The numerous sources of error which were to be apprehended in experiments of this kind conducted on a small scale, induced the authors to apply for the means of executing them on a larger scale; and the present paper contains the introductory part of their researches with apparatus furnished by the Royal Society, comprising a force pump worked by a steam-engine and capable of propelling 250 cubic inches of air per second, and a series of tubes by which the elastic fluid is conveyed through a bath of water, by which its temperature is regulated, a flange at the terminal permitting the attachment of any nozle which is desired.

Preliminary experiments were made in order to illustrate the thermal phenomena which result from the rush of air through a single aperture. Two effects were anticipated, one of heat arising from the *vis viva* of air in rapid motion, the other of cold arising from dilatation of the gas and the consequent conversion of heat into mechanical effect. The latter was exhibited by placing the bulb of a very small thermometer close to a small orifice through which dry atmospheric air, confined under a pressure of 8 atmospheres, was permitted to escape. In this case the thermometer was depressed 13° Cent. below the temperature of the bath. The former effect was exhibited by causing the stream of air as it issued from the orifice to pass in a very narrow stream between the bulb of the thermometer and a piece of gutta percha tube in which the latter was enclosed. In this experiment, with a pressure of 8 atmospheres, an elevation of temperature equal to 23° Cent. was observed. The same phenomenon was even more strikingly exhibited by pinching the rushing stream with the finger and thumb, the heat resulting therefrom being insupportable.

The varied effects thus exhibited in the "rapids" neutralize one another at a short distance from the orifice, leaving however a small cooling effect, to ascertain the law of which and its amount for various gases, the present researches have principally been instituted. A plug of cotton wool was employed, for the purpose at once of preventing the escape of thermal effect in the rapids, and of mechanical effect in the shape of sound. With this arrangement a depression of 0°·31 Cent. was observed, the temperature of the dry atmospheric air in the receiver being 14°·5 Cent., and its pressure 34·4 lbs. on the square inch, and the pressure of the atmosphere being 14·7 lbs. per square inch.

Erratum.—In Mr. Joule's letter to Col. Sabine, "Proceedings of the Royal Society," p. 307, line 27, *for* 2·67 *read* 0·267.

6. "On Clairaut's Theorem and Subjects connected with it." By Matthew Collins, Esq., B.A., Senior Moderator in Mathematics and Physics of Trin. Coll. Dublin. Communicated by S. Hunter Christie, Esq., M.A., Sec. R.S. &c. Received May 2, 1853.

The author begins his investigations by proving the existence of principal axes for any point of a body, which he makes to depend on the existence of principal axes of an auxiliary ellipsoid (Poinsot's central one) having its centre at the given point, and such that any semidiameter of it is reciprocally proportional to the radius of gyration of the body about that semidiameter.

He afterwards employs another ellipsoid (called M^c^Cullagh's ellipsoid of inertia) concentric to the former and reciprocal to it, which admirably suits and facilitates the remainder of his investigations, and whose characteristic property is this, that it gives the radius of gyration itself (and not its reciprocal, as in Poinsot's) about any semidiameter of it, the radius of gyration being in fact equal to the portion of that semidiameter between the centre and a tangent plane perpendicular to it.

He then proves that the attraction of a body of any shape, whose